I CLAIM:

1. An apparatus for remote detection of selected trace constituents in flue gases, in use with an installation comprising at least one stack for discharging flue gases to atmosphere and at least one building providing an enclosed area, the apparatus comprising:

a laser for generating a laser beam;

an optical transmission means, for transmitting the laser beam through a flue gas, and connected to the laser;

a receiving means for receiving a returned laser beam after transmission through the flue gas;

a detector means for analyzing the returned laser beam for detecting the presence of any of the selected trace constituents by comparison of the transmitted and returned beams; and

an optical fiber connection means providing a connection between (i) the laser and the optical transmission means, and between (ii) the receiving means and the detector means;

wherein the optical transmission and the receiving means are mounted to one stack, adjacent the top thereof, whereby the laser beam is transmitted through the flue gases discharged from the stack, and wherein the laser and the detector means are located in the enclosed area of the building, whereby the laser and the detector means are protected by the building, the optical transmission means and the receiving means are remote from the laser and the detection means and are connected thereto by the optical fiber connection means.

2. An apparatus as claimed in claim 1, wherein the optical fiber connection means comprises a first optical fiber connecting the laser to the optical transmission means, and connecting the receiving means to the detector means for transmission of a returned beam.

3. An apparatus as claimed in claim 2, wherein the optical fiber is a single mode fiber.

4. An apparatus as claimed in claim 3, which includes a beam splitter and combiner means connected between the laser and the optical fiber, the beam splitter and combiner means also being connected to the detector means.

5. An apparatus as claimed in claim 4, which additionally includes a reference cell connected to the beam splitter and combiner means for receiving part of the radiation from the laser, for reference purposes.

6. An apparatus as claimed in claim 5, which includes a plurality of lasers, and, for each laser, a respective beam splitter and combiner means connected thereto and a reference cell and a detector both connected to the beam splitter and combiner means, and wherein the apparatus includes a first multiplexer means having a plurality of connections on one side, each connected to one of the beam splitters and combiner means, and a connection on the other side to the transmission means and the detector means.

7. An apparatus as claimed in claim 6, which includes a second multiplexer means having an input connected to the other side of the first multiplexer means, and a plurality of outputs and wherein the apparatus includes a plurality of pairs of transmission means and receiving means, each pair of transmission and receiving means being connected to one output of the second multiplexer means.

8. An apparatus as claimed in claim 1, which includes at least one of: (a) multiplexer means and a plurality of pairs of transmission means and receiving means, the multiplexer means providing a connection between

the optical fiber connection means and the pairs of transmission and receiving means for selective connection to one pair thereof, and (b) a plurality of lasers and beam splitter and combiner means connecting the lasers to the optical fiber connection means for simultaneous transmission and reception of at least two different laser beams.

9. An apparatus as claimed in claim 1, wherein the optical fiber transmission means comprises a first optical fiber connecting the laser to the optical transmission means, and a second optical fiber transmitting a returned beam from the receiving means to the detector means, wherein the apparatus includes a plurality of pairs of optical transmission means and receiving means, wherein each of the first and second optical fibers comprises a first portion and a plurality of second portions, wherein the apparatus further includes a first optical multiplexer having an input connected to the first portion of the first optical fiber, the other end of which is connected to the laser, wherein the plurality of second portions of the first optical fiber provide connections between the first multiplexer and the optical transmission means, wherein a second multiplexer has an output connected to the first portion of the second optical fiber, the other end of which is connected to the detector means, and wherein the plurality of second portions of the second optical fiber provide connections between the second multiplexer and the receiving means, the first and second multiplexers being operable to connected a selected pair of the transmission means and the receiving means to the laser and the detector means.

10. An apparatus as claimed in claim 7, which includes a plurality of lasers, and beam splitter and combiner means for combining the outputs from the lasers for communication through the first optical fiber and wherein each laser has an associated beam splitter and combiner means to which its output is connected, each of which beam splitter and combiner

means has one output providing a connection to the first optical fiber and another output connected to a reference cell.

11. An apparatus as claimed in claim 1, wherein the receiving means is separate from the optical transmission means, for mounting on either side of an area through which a fluid to be analyzed passes, and wherein the optical fiber connection means comprises a first, transmission optical fiber connecting the laser to the optical transmission means, and a second, return optical fiber transmitting a returned beam from the receiving means to the detector means.

12. An apparatus as claimed in claim 9, wherein the transmission means and the receiving means comprise a point source monitor, including a multipass sample cell, providing an extended analytical path and wherein the optical fiber connection means comprises a first, transmission optical fiber connecting the laser to the optical transmission means, and a second, return optical fiber transmitting a returned beam from the receiving means to the detector means.

13. An apparatus for the remote detection of selected trace constituents in flue gases, in use with an installation comprising at least one stack for discharging flue gases to atmosphere and at least one building providing an enclosed area, the apparatus comprising:

a laser for generating a laser beam;

a plurality of pairs of an optical transmission means for transmitting the laser beam through a flue gas, and a receiving means for reciving a returned laser beam after transmission through the flue gas;

a detector means for analyzing the returned laser beam for detecting the presence of any of said selected trace constituents for comparison of the transmitted and returned beams;

a multiplexer means providing a connection between the laser and the optical transmission means and between the receiving means and the detector means; and

an optical fiber connection means providing a connection between a laser and the optical transmission means and between the receiving means and the detector means;

wherein each pair of an optical transission means and a receiving means is mounted to one stack adjacent the top thereof, whereby a laser beam is transmitted through the flue gases discharged in the stack, and wherein the laser, the detector means and the multiplexer means are located in the enclosed area of the building, whereby the laser, the detector means and the multiplexer means are protected by the building, the pairs of optical transmission means and detection means are remote from the laser and the detection means and are connected thereto by the optical fiber connection means, and the multiplexer means can selectively connect the laser to any one pair of the optical transmission means and the detector means.

14. An apparatus as claimed in claim 13, which includes a plurality of lasers, wherein the beam splitter and combiner means is connected to the lasers, wherein each laser has a respective reference cell connected to the beam splitter and combiner means for receiving a portion of the radiation thereof for reference purposes, and wherein a detector is provided for each laser, connected to the beam splitter and combiner means for receiving a portion of the radiation returned back to the detector.

15. An apparatus as claimed in claim 13, which includes a plurality of lasers and beam splitter and combiner means providing a connection between the lasers and the multiplexer means.

16. An apparatus as claimed in claim 15, wherein the beam splitter and combiner means provides an output for a reference signal from each laser and includes reference cell means connected to the output of the beam splitter and combiner means.

17. An apparatus as claimed in claim 16 wherein the beam splitter and combiner means receives the returned laser beam and includes a further output connection connected to the detector means.

18. An apparatus as claimed in claim 16, wherein the multiplexer means has a first multiplexer having a plurality of connections on one side, connected to the transmission means and the reeiving means, and having a first pair of connection ports on the other side, and a second multiplexer comprising a plurality of connections on one side connected to the lasers and the detector means, and a second pair of connection ports on the other side connected to the first pair of connection ports of the first multiplexer.

19. An apparatus as claimed in claim 15, wherein the multiplexer means has a plurality of connections on one side connected to the transmission means and the receiving means and a connection port on the other side thereof, and wherein the apparatus includes a plurality of beam splitter and combiner means which are connected together to form a single connection ~~connected to the~~ connection ~~port of~~ the multiplexer means and which are connected to the lasers and to the detector means, whereby each laser beam is connected through to the multiplexer means and a return beam is connected through to the detector means, and wherein the beam splitter and combiner means ~~provide outputs for reference signals~~ from the lasers, the apparatus including reference cell means connected to said outputs.

20. An apparatus for the remote detection of selected trace constituents in a fluid, the apparatus comprising:

a laser for generating a laser beam;

a plurality of probes selected from: a pair of an optical transmission means for transmitting the laser beam through the fluid and a receiving means for receiving a returned laser beam after transmission through the fluid; a point source monitor including a multipass cell, providing an extended analytical path; and a stack probe for monitoring fluid flow including dust particules, the probe including means for maintaining optical transmission services free of dust particles;

~~a detector means for analyzing~~ a return laser beam for detecting the presence of any of the selected trace constituents by comparison of the transmitted and returned beams;

a multiplexer means for providing selected connection between one of the probes and the laser and the detector means; and

optical fiber connection means providing a connection between the multiplexer means and the probes, and between the multiplexer means and each of the detector means and the laser.